

Ultra Scientific CLP-ICP Spike Standards**Standard #1**
Table

Element	True Value (mg/L)	NIST SRM
Al	2000	3101a
Ba	2000	3104a
Be	50.0	3105
Cr	200.0	3112
Co	500.0	3113
Cu	250.0	3114
Fe	1000	3126a
Mn	500.0	3132
Ni	500.0	3136
Ag	50.0	3151
V	500.0	3165
Zn	500.0	3168

Standard #2
Table

Element	True Value (mg/L)	NIST SRM
Sb	500.5	3102

Standard #3
Table

Element	True Value (mg/L)	NIST SRM
As	2000.0	3103
Cd	50.0	3108
Pb	500.0	3128
Se	2000.0	3149
Tl	2000.0	3158

Definitions

Accuracy	The closeness of a measured value to a true value (precision).
Acid	Any substance that can donate a hydrogen atom or proton (H^+) to any other substance.
Acid rain	Rain characterized by pH values below 6.
Acidic	Characterized by $pH < 7$.
Acidity	The amount of a strong base (e.g. Sodium Hydroxide) necessary to titrate a sample to a pH of around 10.3; measures the base neutralizing capacity of a water; an acid quality or state.
Alkaline	Characterized by $pH > 7$.
Alkalinity	The amount of strong acid (e.g. Hydrochloric Acid) necessary to titrate a sample to a pH of around 4.5. Measures the acid neutralizing capacity of a water and is often reprinted as ppm $CaCO_3$.
Aqueous	Containing or contained in water.
Background concentration	The level of chemicals present in a water due to natural processes rather than due to human contribution.
Base	Any substance that accepts a proton (H^+) from another substance.
Brackish water	Water containing dissolved salts at a concentration less than seawater, but greater than fresh water. The concentration of dissolved salts is usually in the range 1000 to 10,000 ppm.
Buffer solution	One that resists change in its pH when either hydroxides (OH^-) or protons (H^+) are added. The stable and known pH value of these solutions make them suitable for calibrating pH measuring devices.
Calibration	To set or check an instrument against an index or standard of known value through some type of proportional or statistical relationship.
Chlorinity	The chlorine concentration of a solution.

CHO Chemical Hygiene Officer.

Colorimetric method Many procedures for measuring dissolved substances depend on color determination. The underlying assumption is that the intensity of the color is proportional to the concentration of the dissolved substance in question.

Conductivity The ability of an aqueous solution to carry an electrical current. Depends upon the concentration of dissolved salts (ions), the type of ions, and the temperature of the solution. Typical units are microSiemens/cm or micromhos/cm. (These are equivalent.)

Denitrification The act or process of reducing nitrate to ammonia. Nitrite may be an intermediate product.

Density The ratio of the mass of a substance to its volume.

Dissolved analyte The concentration of analyte in an aqueous sample that will pass through a 0.45 micron membrane filter assembly prior to sample acidification.

Dissolved oxygen The mass of molecular oxygen dissolved in a volume of water. The solubility of oxygen is affected nonlinearly by temperature; more oxygen can be dissolved in cold water than in hot water. Pressure and salinity also affect the solubility of oxygen in water; salinity reduces the solubility of oxygen in water.

Dissolved solids Solid particles that have become liquid by immersion or dispersion in a liquid (e.g. salts).

Enrichment Making a water more productive (e.g. by adding nutrients).

Eutrophication A high level of productivity in a water body, often due to an increased supply of nutrients.

Evaporation (of water) Change from liquid to vapor at a temperature below the boiling point.

Hydrologic cycle (water cycle) The series of stages through which water passes from the atmosphere to the earth and returns to the atmosphere. Includes condensation to form clouds, precipitation, accumulation in soils or bodies of water and re-evaporation.

Hypothesis A tentative statement made to test its logical or empirical consequences.

In situ (Latin) Situated in its original natural place.

Laboratory Duplicates Two aliquots of the same sample taken in the laboratory and analyzed separately with identical procedures. Analyses of duplicates indicate precision associated with laboratory procedures, but not with sample collection, preservation or storage procedures.

Laboratory Fortified Blank (LFB) An aliquot of LRB to which known quantities of the method analytes are added in the laboratory. The LFB is analyzed exactly like a sample, and its purpose is to determine whether the methodology is in control and whether the laboratory is capable of making accurate and precise measurements.

Laboratory Fortified Matrix Spike (LFM) An aliquot of an environmental sample to which known quantities of the method analytes are added in the laboratory. The LFM is analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate aliquot and the measured values in the LFM corrected for background concentrations.

Laboratory Reagent Blank (LRB) An aliquot of reagent water or other blank matrices that are treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, and internal standards that are used with other samples. The LRB is used to determine if method analytes or other interferences are present in the laboratory environment, reagents or apparatus.

Lentic Relating to, or living in standing water (lakes, ponds or swamps).

Logarithmic scale A scale in which each unit increment represents a tenfold increase or decrease.

Lotic Relating to, or living in actively moving water (streams or rivers).

MicroSiemens/cm Metric unit of measurement for conductivity. Equivalent to micromhos/cm.

Micromhos/cm Standard unit of measurement for conductivity. Equivalent to microSiemens/cm.

Molar Unit of measurement for concentration (moles per liter of solution).

Molecule The smallest fundamental unit (usually a group of atoms) of a chemical compound that can take part in a chemical reaction.

Natural waters	Systems that typically consist of the sediments/minerals and the atmosphere as well as the aqueous phase; they almost always involve a portion of the biosphere.
Neutral	Characterized by pH = 7.
Nitrate	A salt of nitric acid (HNO_3). Nitrates are often highly soluble and can be reduced to form nitrites or ammonia.
Nitrate-nitrogen	Concentrations of nitrate (NO_3^-) are often expressed as mass of nitrogen per volume of water.
Nitrite	A salt of nitrous acid (HNO_2). Nitrites are often highly soluble and can be oxidized to form nitrates or reduced to form ammonia.
Nitrite-nitrogen	Concentrations of nitrite (NO_2^-) are often expressed as mass of nitrogen per volume of water.
pH	The negative logarithm of the molar concentration of protons (H^+) in solution.
Photosynthesis	The process in which the energy of sunlight is used by organisms, especially green plants to synthesize carbohydrates from carbon dioxide and water.
Ppm	Usually parts per million.
Precipitation	The falling products of condensation in the atmosphere (e.g. rain, snow, hail); separation in solid form from a solution due to chemical or physical changes (e.g. adding a reagent or lowering the temperature).
Precision	A measurement for the degree of agreement between multiple analyses of a sample (See accuracy).
Productivity	The formation of organic matter averaged over a period of time such as a day or a year.
Proton	A positively charged elementary particle found in all atomic nuclei. The positively charged hydrogen atom (H^+).
Reagent	A substance used to cause a reaction, especially to detect another substance.
Reduce	In chemical terms, to change from a higher to a lower oxidation state (i.e. gain electrons).

Runoff	The component of precipitation that appears as water, flowing in a stream or river.
Salts	Ionic compounds which in water solution yield positive (excluding H^+) and negative (OH^-) ions; the most common of which is sodium chloride, or table salt.
Saturated solution	A solution that contains the maximum amount of dissolved substances at a given temperature and pressure.
Solubility	The relative capability of being dissolved.
Solute	A substance that dissolves in another to form a solution.
Solution	A homogeneous mixture containing two or more substances.
Solvent	A substance that dissolves another to form a solution.
Specific gravity	The ratio of the density of a substance to the density of water (at $25^\circ C$ and 1 atmosphere).
Standardization	To cause to conform to a standard.
Standard	A measure with a value established through outside means for use in calibration; a known reference.
Suboxic water	Very low levels of dissolved oxygen; denitrification occurs (nitrate is converted to ammonia).
Suspended solids	Solid particles in a fluid that do not dissolve or settle out.
Suspensions	A mixture in which very small particles of a solid remain suspended without dissolving.
Titrant	The reagent added in a titration.
Titration	The process of ascertaining the quantity of a given constituent by addition of a liquid reagent of known strength, and measuring the volume of reagent necessary to convert the constituent through a given reaction.
Topography	The surface relief features of an area.
Total dissolved solids	The total mass of solids remaining when a given volume of filtered water is evaporated to total dryness following an accepted procedure.

Total Recoverable Analyte	The concentration of analyte determined either by direct analysis of an unfiltered acid preserved water sample with turbidity of < 1 NTU, or by analysis of an unfiltered aqueous sample following digestion by refluxing with hot dilute mineral acids as specified by the method.
Turbid	Not clear, or transparent due to stirred up sediment.
Water quality	A distinctive attribute or characteristic trait of water, described by physical, chemical and biological properties.
Water sample	For the purpose of this method, a sample taken from one of the following sources: drinking, surface (pond), ground, storm runoff, industrial or domestic wastewater
Watershed	A line of separation between waters flowing to different rivers, basins or seas; a term to mean the area drained by a river or stream.
Water vapor	Water in the gaseous phase.

References and Related Procedures

Suggested Textbooks to Compliment the Chihuahuan Desert Lab Course

Jacobson, Cliff. *Water, Water Everywhere, Second Edition Series*. Hach Company, PO Box 389, Loveland CO 80539. 1991. 1-800-227-4224.

References

EPA Method 200.7 “Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-Atomic Emission Spectrometry” Revision 4.4, 1994.

Carlsbad Environmental Monitoring and Research Center Chemical Hygiene Plan

Related Procedures

CEMRC SOPEC-001

Labware Preparation for Inorganic Analysis

CEMRC SOPEC-004

Elemental Analysis by Inductively-Coupled Plasma Emission Spectrometry

CEMRC SOPEC-005

Mercury Analysis of Waters, Air Filters, Soils and Sediments by Flow Injection Cold Vapor Atomic Absorption Spectrometry

CEMRC SOPEC-006

Analysis of Waters, Air Filters, Soils and Sediments by Flow Injection Hydride Atomic Absorption Spectrometry

CEMRC SOPEC-007

Analysis of Waters, Air Filters, Soils and Sediments by Graphite Furnace Atomic Absorption Spectrometry

CEMRC SOPEC-010

Mercury Analysis of Water, Air Filters, Soils and Sediments by Flow Injection Cold Vapor Atomic Absorption Spectrometry using Bromine Monochloride Digestion and Gold Amalgamation Preconcentration